

What is the relationship between alcohol consumption and postnatal growth patterns, sleep patterns and psychomotor patterns of the offspring?

Conclusion

Limited evidence suggests that alcohol consumption during lactation was associated with altered postnatal growth, sleep patterns and/or psychomotor patterns of the offspring.

Grade: Limited

Overall strength of the available supporting evidence: Strong; Moderate; Limited; Expert Opinion Only; Grade not assignable For additional information regarding how to interpret grades [click here](#)

Evidence Summary Overview

This conclusion is based on the review of five studies examining the relation of mother's alcohol consumption during lactation on growth (Backstrand JR et al, 2004), psychomotor development (Little et al, 1989 and Little et al, 2002) and wake and sleep patterns (Mennella JA, Garcia PL, 2001 and Mennella JA, Gerrish CJ, 1998). Backstrand JR et al, 2004 evaluated the effects of pulque (a mildly alcoholic beverage) intake in a prospective cohort of 58 lactating women from rural Central Mexico and found heavier pulque intake during lactation was associated with slower postpartum growth from month one to 57 months ($P=0.0054$ for weight and $P=0.0073$ for length). Little et al, 1989 reported that infant motor development at age one, as measured by the Psychomotor Development Index (PDI), was significantly lower in infants exposed regularly to alcohol in breast milk (mother's alcohol intake of at least 0.5 oz per day) with a dose response relation ($P=0.006$, for linear trend). There was no association found between maternal alcohol use and infant mental development, as measured by the Bayley Mental Development Index. These findings were not replicated by Little et al in 2002 in a sample of 915 18-month age toddlers from the United Kingdom, where infants with the highest alcohol exposure had the highest Griffiths scores in three of five scales, after adjustment for education and other associated factors. Mennella JA, Garcia PL, 2001 and Mennella JA, Gerrish CJ, 1998, using within-subject design studies, found short-term exposure to small amounts of alcohol in mothers' milk produces distinctive changes in the infants' sleep-wake patterning.

Evidence Summary Paragraphs

Growth

Backstrand JR et al, 2004 (positive quality), conducted a prospective cohort study to examine maternal intake of a mildly alcohol beverage (pulque) during pregnancy and lactation, and the potential effect on postpartum child growth and attained size. The study followed 58 mothers and their offspring (from birth to approximately 57 months of age), from rural Central Mexico. Dietary assessment was conducted for two days per month during lactation. A total of 72% of mothers consumed pulque during lactation and the average ethanol intake was 113.8 g per week. At month one, the children were relatively short in length, although of average weight-for-age; weight-for-length were well above the reference median. By 57 months, mean length-for-age and weight-for-age had declined substantially. At this age, 52.7% of the children were stunted and 24.1% were underweight. At 57 months, heavier pulque intake during lactation was associated with lower weight ($P=0.0242$) and length ($P=0.0287$). Heavier pulque intake during lactation was associated with slower postpartum growth from month one to 57 months (weight, $P=0.0054$ and length, $P=0.0073$). In

general, the attained size measurements were associated with pulque intake during both pregnancy and lactation, while the child growth measurements were only associated with intake during lactation. In conclusion, pulque intake during lactation may adversely influenced postnatal growth in this population.

Psychomotor Development

Little et al, 1989 (positive quality), conducted a prospective study to investigate the relation of the mother's intake of alcohol during breastfeeding to the infant's mental and motor development. Four-hundred infants born to member of a health maintenance organization were evaluated at one year of age. Mental development, as measure by the Bayley Mental Development Index (MDI), was unrelated to maternal drinking during breastfeeding. However, motor development, as measured by the Psychomotor Development Index (PDI), was significantly lower in infants exposed regularly to alcohol in breast milk (after alcohol exposure during gestation was controlled for), with a dose response relation ($P=0.006$; for linear trend). The infants of breastfeeding mothers who had at least one drink daily (0.5 oz) had a mean PDI score of 98, whereas the infants exposed to less alcohol in breast milk had a mean PDI score of 103 (95% CI for the difference of the two means, 1.2 to 9.8). The effect was strong when mothers who supplemented breastfeeding with formula were excluded from the analysis. The regression analysis showed a predicted decreased of 5.4 points in the PDI for a breastfed infant with an AA score of 1.0, as compared with an infant with no alcohol exposure. In conclusion, ethanol ingested through breast milk has a significantly detrimental effect on motor development in breastfed infants.

Little et al, 2002 (positive quality), conducted a prospective cohort study to evaluate the influence of moderate alcohol use during lactation on the mental development of 915 randomly selected eighteen-month-old toddlers enrolled in a longitudinal population-based study in the United Kingdom. The study used the Griffiths Developmental Scale for the toddlers, and self-administered frequency questionnaires (FFQ) during and after pregnancy to assess alcohol intake. The dose or alcohol available to the lactating infant was obtained by multiplying the alcohol intake of the mother by the proportion of breast milk in the infant's diet. This dose was compared with the Griffiths Scale of Mental Development, taking into account potentially confounding variables. The Griffiths Scale includes the following measurements: Locomotor, hand and eye coordination, performance test and the General Intelligence Quotient (GQ). Only 5% of mothers had two or more drinks a day during the postpartum period; the average alcohol used was 1.0 or more. Binges in the postpartum period were reported by 37% of all women. For all scales, with the exception of hand-eye coordination and hearing and speech, infants with the highest alcohol exposure via breast milk had the highest Griffiths scores.


Sleep/Wake Patterns


Mennella JA, Garcia PL, 2001 (positive quality), conducted a within-subjects design study to test the hypothesis that infants would compensate less active sleep after exposure of alcohol in their mother's milk. Twenty-three breast-fed infants from three to five months of age and their mothers were tested on two days, separated by one week. A small, computerized movement detector, an actigraph, was placed on the infants' left ankles to monitor sleep and activity patterning after which they were bottle-fed mother's milk alone (control condition) on one test day and mother's milk containing 32 mg of ethanol per 100ml on the other. The infants' behaviors were monitored for the next 24 hours; the first 3.5 hours of monitoring on each test day took place at the Monell Center. Infants exhibited significantly less active sleep during the 3.5 hours immediately after exposure to alcohol in mothers' milk compared with the control condition; the decrease in active sleep was observed in all but four of the infants tested. Compensatory increases in active sleep were then observed in the next 20.5 hours, when mothers refrained from drinking alcohol. These findings demonstrate that short-term exposure to small amounts of alcohol in mothers' milk produces distinctive changes in the infants' sleep-wake patterning.



Mennella JA, Gerrish CJ, 1998 (positive quality), conducted a randomized control trial (RCT) to test the hypothesis that exposure to alcohol in breast milk affects infants' sleep and activity levels in the short term. Thirteen lactating women and their infants were tested on two days, separated by an interval of one week. On each testing day, the mother expressed 100 ml of milk, while a small, computerized movement detector

called an actigraph was placed on the infant's left leg to monitor sleep and activity patterning. After the actigraph had been in place for 15 minutes, the infants ingested their mother's breast milk flavored with alcohol (32mg) on one testing day and breast milk alone on the other. The infants' behaviors were monitored for the next 3.5 hours. The infants spent significantly less time sleeping during the 3.5 hours after consuming the alcohol-flavored milk (78.2 minutes compared with 56.8 minutes after feeding alcohol in breast milk). This reduction was apparently attributable to a shortening in the longest sleeping bout (34.5 compared with 56.7 minutes for sleeping after breast milk alone) and the amount of time spent in active sleep (25.8 minutes compared with 44.2 minutes after breast milk alone); the decrease in active sleep was observed in all but two of the 13 infants tested.


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Author, Year, Study Design, Class, Rating	Study Subjects	Measurements	Treatment	Key Outcomes
<p>Backstrand JR, Goodman AH et al, 2004</p> <p>Study Design: A prospective cohort study</p> <p>Class: B</p> <p>Rating: </p>	<p>Data from the Mexico nutrition and CRSP and follow-up study (1984 to 1986 and 1992) in rural Central Mexico.</p> <p>N=58 mother-child pairs.</p>	<p>Two days per month, 24-hour recall.</p> <p>Weight.</p> <p>Length.</p> <p>Period: From birth to 57 months.</p>	<p>72.4% of mothers.</p> <p>Average ethanol intake: 113.8g per week (N=58).</p>	<p>Growth Stunting:</p> <p>Heavier pulque intake during lactation associated with slower postpartum growth from month one to 57 (weight; P=0.0054 and length; P=0.0073.</p> <p>At 57 months, heavier pulque intake during lactation associated with ↓ weight (P=0.0242) and length (0.0287).</p> <p>By 57 months, mean height-for-age and weight-for-age had ↓ substantially. More than half of children (52.7%) were stunted and nearly a quarter (24.1%) were underweight.</p>

<p>Little RE et al 1989</p> <p>Study Design: Prospective Cohort Study</p> <p>Class: B</p> <p>Rating: </p>	<p>Data from the Group Health Cooperative of Puget Sound in Seattle (1982 to 1983).</p> <p>N=400 mothers and infants.</p> <p>Age: One year.</p> <p>“Long-term breast-feeders:” Infants from women who breastfed their infants for >three months.</p> <p>“Short-term breast-feeders:” Infants from women who breastfed them for <one month.</p>	<p>Absolute Alcohol (AA) consumed by mother (“maternal AA score”) was an estimate of the average number of ounces of ethanol ingested daily, computed by determining amount of ethanol ingested in both usual and max quantities and weighting these values against frequency of consumption.</p> <p>Infants' development with Bayle Scales of Infant Development (both mental and psychomotor scales), Mental Development Index (MDI).</p> <p>Psychomotor Development Index (PDI) of breastfed infants (who obtained all or nearly all nourishment from breast milk, receiving more than 473ml (16oz) of formula per day.</p> <p>Mothers' ethanol intake, energy intake, protein and selected micronutrients by food consumption over a four-day period.</p>	<p>N=153 “Heavier” drinkers: Mothers with an AA score of ≥ 1.0, or a report of binge drinking [consumption on a single occasion of $\geq 74\text{ml}$ (2.5oz) of ethanol].</p> <p>N=247 “Lighter” drinkers: All other mothers, including non-drinkers. Maternal AA score of $1.0=29.6\text{ml}$ (1oz) of ethanol daily intake (equivalent of two drinks).</p> <p>Infant AA score: estimated infant's exposure to ethanol in the postpartum period by weighting the mother's AA score.</p>	<p>Psychomotor Development and General Intelligent Quotient:</p> <p>No relation apparent between infants' exposure to ethanol and MDI.</p> <p>Strong linear relation between level of exposure to ethanol in breast milk and PDI ($P=0.006$ for linear trend), mean PDI scores for: Infants of breastfeeding mothers who had at least one drink daily = 98 (95% CI for the difference of the two means, 1.2 to 9.8).</p> <p>Regression analysis showed a predicted \downarrow of 5.4 points in the PDI for breastfed infant with AA score of 1.0, as compared with infant with no alcohol exposure.</p> <p>Mean PDIs of the infants exposed only to small quantities of ethanol in breast milk (Infant AA score, <0.5) did not vary significantly between infants who had no exposure.</p>
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<p>Little RE et al 2002</p> <p>Study Design: Prospective Cohort Study</p> <p>Class: B</p> <p>Rating: </p>	<p>Data from the Avon Longitudinal Study of Parents and Children (ALSPAC) (1991-92).</p> <p>N=1,175; Final N=915.</p> <p>Age: 18-month-old toddlers.</p>	<p>Self-reported lactation history (at six months postpartum), alcohol consumption (at eight weeks after delivery) and FFQ.</p> <p>Griffiths Developmental Scale for toddlers at 18 months of age (10% were evaluated later).</p> <p>Partially breastfed: 55% breast milk and 45% formula.</p>	<p>Infant Alcohol exposure via breast milk (IAA):</p> <ul style="list-style-type: none"> • N=295; >zero to <0.1 • N=257; 0.1 to 0.4 • N=51; 0.5 to 0.9 • N=17; 1.0. <p>IAA: Dose or alcohol available to lactating infant = alcohol intake of mother x proportion of breast milk in infant's diet.</p>	<p>Psychomotor Development and General Intelligent Quotient:</p> <p>Only 5% of mothers had \geqtwo drinks a day during postpartum period; average alcohol used was \geq1.0. Binges in postpartum period reported by 37% of all women.</p> <p>For all scales with the exception of hand-eye coordination and hearing and speech, infants with the highest alcohol exposure via breast milk had highest Griffiths score.</p>
<p>Menella JA and Garcia PL, 2001</p> <p>Study Design: Non-Randomized Controlled Trial</p> <p>Class: C</p> <p>Rating: </p>	<p>Subjects recruited from ads in local newspapers and from WIC centers in Philadelphia.</p> <p>N=23 (13 girls, 10 boys).</p> <p>Age: 3.1 to 5.1 months.</p>	<p>Infant sleep and activity rhythms with an actigraph.</p>	<p>Babies were fed with 100ml of breast milk.</p> <p>Control day: Milk alone.</p> <p>Test day: Milk containing 32mg of ethanol.</p> <p>Mean actually consumed = 30.5 ± 0.3mg.</p>	<p>Changes in Sleep/wake Patterns:</p> <p>Significant interaction between time since exposure (zero to 3.5 vs. 3.5 to 24 hours) and experimental test day (i.e., control, alcohol) for the amount of time that infants spent in active sleep [F(1,21df)=14.1; P=0.001].</p> <p>Infants spent \downarrow time in active sleep [paired t (22df)=2.11; P=0.05] during the</p>


				<p>hours immediately after exposure to alcohol in mothers' milk.</p> <p>↓ in active sleep observed in 19 of the 23 infants.</p> <p>Effects of alcohol exposure on active sleep were not immediate [F(1,22df)=8.68; P=0.007].</p> <p>Infants spent significantly ↓ time in active sleep during the second half of the test session (i.e., 1.75 to 3.5 hours), in which they were fed alcohol in mothers' milk, compared with mothers' milk containing no alcohol [paired t (22df)=3.68; P=0.001].</p> <p>Infants compensated for such ↓ when their mothers refrained from drinking alcohol [paired t(21df)=-2.73; P=0.01].</p>
<p>Menella JA and Gerrish CJ, 1998</p> <p>Study Design: Non-Randomized Controlled Trial</p>	<p>Subjects recruited from ads in local newspapers and from WIC centers in Philadelphia.</p> <p>N=13 (nine girls, four boys).</p>	<p>Infant sleep and activity rhythms with an actigraph.</p>	<p>Babies were fed with 100ml of breast milk.</p> <p>Control day: Milk alone.</p> <p>Test day: Milk containing 40uL</p>	<p>Changes in Sleep/wake Patterns:</p> <p>Infants spent significantly ↓ time in active sleep during second half of testing session</p>

Class: C	Age: 1.5 to 5.6 months.		(Mean) of Control.	(i.e., 1.75 to 3.5 hours) after exposure to alcohol in breast milk, compared with breast milk alone (control vs. alcohol, 25.2 to 5.5 vs. 8.6 to 2.6 minutes; paired T-test (12df) = 3.14; P=0.009).
Rating: 			Mean actually consumed = 31.3±0.6mg.	


Research Design and Implementation Rating Summary

For a summary of the Research Design and Implementation Rating results, [click here](#).


Worksheets

 [Backstrand JR, Goodman AH, Allen LH, Pelto GH. Pulque intake during pregnancy and lactation in rural Mexico: Alcohol and child growth from one to 57 months. *Eur J Clin Nutr*. 2004 Dec; 58 \(12\): 1,626-1,634.](#)

 [Little RE, Anderson KW, Ervin CH, Worthington-Roberts B, Clarren SK. Maternal alcohol use during breast-feeding and infant mental and motor development at one year. *N Engl J Med*. 1989; 321\(7\):425-30.](#)

 [Little RE, Northstone K, Golding J, ALSPAC Study Team. Alcohol, breastfeeding, and development at 18 months. *Pediatrics*. 2002; May;109\(5\):E72-2.](#)

 [Mennella JA, Garcia-Gomez PL. Sleep disturbances after acute exposure to alcohol in mothers' milk. *Alcohol*. 2001 Nov; 25\(3\): 153-158.](#)

 [Mennella JA, Gerrish CJ. Effects of exposure to alcohol in mother's milk on infant sleep. *Pediatrics*. 1998 May; 101\(5\): E2.](#)